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EXAMINER

SARKAR, ASOK K

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 0204

Application Number: 09/841,453
Filing Date: April 24, 2001
Appellant(s): WU ET AL.

Richard S. Roberts
For Appellant

*Mailed date =
3/29/04*

EXAMINER'S ANSWER

(1) Real Party in Interest

This is in response to the appeal brief filed 7/21/2003A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

Art Unit: 2829

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief does not contain a statement identifying which groups of claims stand or fall together and reasons in support thereof. However, based on Appellant's arguments, it is surmised that the claim 2 is meant to stand or fall together, claim 3 is meant to stand or fall together, claim 4 is meant to stand or fall together, claim 5 is meant to stand or fall together, claim 6 is meant to stand or fall together, claim 7 is meant to stand or fall together, the claims 8, 11 – 14 and 17 are meant to stand or fall together, claims 9 and 10 are meant to stand or fall together, claims 15 and 18 – 19 are meant to stand or fall together, claim 16 is meant to stand or fall together. Claim 20 is meant to stand or fall together, claim 21 is meant to stand or fall together, claim 22 is

Art Unit: 2829

meant to stand or fall together, claims 23 and 26 – 29 are meant to stand or fall together, claims 24 and 25 are meant to stand or fall together, claims 32 – 34 are meant to stand or fall together. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

EP 0849,796	Jin	6-1998
5,686,549	Grainger	11-1997
RU 2,089,499	Kotelnikov	9-1997
5,750,610	Burns	5-1998
6,318,124	Rutherford	11-2001

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 2 – 16, 18 – 21 and 31 – 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin, EP 0849,796 in view of Grainger, US 5,686,549 and Kotelnikov, RU 2089499.

Regarding claim 20, Jin teaches nanoporous silica xerogel film produced by hydrolysis/condensation of organosilane compounds (see column 4, lines 23 –28) on a substrate (see Figs. 3 and 7b) whereby the silica film is reacted with a surface modification agent to modify the pore surfaces with HMDS to form a hydrophobic coating on the silica film by reacting silanol groups of the silica film with HMDS in

Art Unit: 2829

column 4, lines 47 - 52. Reacting under conditions for a sufficient period of time to form the hydrophobic coating is inherent in Jin's method.

Jin fails to expressly teach surface modification agent to comprise one type of oligomer or polymer.

Grainger teaches a method of imparting hydrophobicity (see column 4, line 59) to surfaces containing oxygen and hydroxyl groups such as silica gel (see column 12, lines 51 - 58) with types of oligomer and polymer reactive with the silanol groups (see column 5, lines 47 - 40 and column 7, lines 52 - 57) when the silica films are used as a dielectric for microelectronics and formed on a substrate (see detail description of the hydrophobization process in column 14, lines 34 - 67, especially in between lines 39 - 42).

Kotelnikov teaches hydrophobization of silica surfaces with siloxane monomer (see the Abstract of their disclosure).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Jin's hydrophobizing process by replacing the HMDS with an oligomer or polymer as taught by Grainger and Kotelnikov since Jin's hydrophobization process of the porous silica film (gel) is performed by the same type of organosilane compounds. Moreover, replacing Jin's monomer with Grainger's and Kotelnikov's oligomer and/or polymer will provide a silica gel with improved hydrophobicity and other improved properties as taught by Grainger and Kotelnikov in the lower half of page 3 of the English Translation.

Art Unit: 2829

Regarding claim 2, Grainger teaches the presence of solvent during reaction in column 12, lines 10 – 12.

Regarding claims 3 and 4, Jin and Burns teaches the dielectric film of dielectric constant of 1.3 - 3 (see Jin, column 1, line 27) silica gel which inherently contains pores and silanol groups (Jin, column 4, line 43) and Grainger teaches the reaction conditions where the reaction is conducted for sufficient amount of time in column 12, lines 22 – 32.

Regarding claims 5 and 6, Grainger teaches temperature range of 20 – 250°C (room temperature – molten temperature) in column 12, lines 22 – 32 and Jin teaches rinsing with the silazane compound (short reaction time) in column 4, lines 48 – 50 and Kotelnikov teaches reaction time of about an hour in second paragraph of page 6.

Regarding claim 7, Jin teaches surface modification agent of a silazane compound capable of reacting with the silanols in column 4, lines 47 - 52. The oligomer and the polymer of the same type of monomers have the same functional groups and are capable of reacting with the silanols (see Grainger, column 5, lines 47 – 40 and column 7, lines 52 – 57).

Regarding claims 8, 11, 14, 18 and 19, Grainger teaches polymeric siloxanyls in column 5, line 49 and organosiloxanes in column 7, line 53, which are formed by reacting a suitable monomers (e.g. methylsiloxane) in a solvent and are also disclosed in the polymer synthesis process of various examples in columns 7 – 11.

Regarding claims 9 and 10, Grainger teaches hydrocarbon as solvent in column 12, lines 18 - 19.

Regarding claims 12 and 13, Grainger teaches the presence of organic solvent for the reaction in their reaction process but fails to expressly teach water and the water to organic cosolvent ratio.

However, it would have been obvious to one with ordinary skill in the art at the time of the invention to use a water miscible starting monomer since low molecular weight siloxane and silane monomers are water soluble and therefore a mixture of water miscible monomer and organic solvent can be used for the hydrophobization treatment and judiciously adjust and control these parameters during the hydrophobization process of silica gel film through routine experimentation and optimization to achieve optimum benefits (see MPEP 2144.05).

Regarding claim 15 and 16, Jin teaches surface treatment with a monomeric surface modifying agent and Grainger teaches, in addition, surface treatment with a polymeric surface modifying agent that reacts with the silanol groups of the silica gel and it would have been obvious to one with ordinary skill in the art at the time of the invention to apply Jin's process and then modify the process by applying Grainger's process.

Regarding claim 21, Jin teaches strong nanoporous silica film (dielectric constant of 1.3 – 3 in column 1, line 27) suitable for drying and polishing in columns 4 and 5, but fails to expressly teach the break strength of 2000 PSI.

However, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Jin's process by applying Burns' process and produce a silica gel structure of break strength above 2000 PSI by controlling the porosity of the

Art Unit: 2829

gel by proper drying process since strength of a material is controlled by the amount and the size of the pores.

Regarding claim 31, Jin fails to teach a polymeric siloxane compound.

Grainger teaches polymeric siloxane compounds having a formula $(-SiXR-O-)_n$ in column 6, line s 14 – 18, where $X = H$ and $R = \text{methyl}$ and $n > 2$.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Jin's process by applying a polymeric surface modifying agent of formula $(-SiXR-O-)_n$ in stead of the monomer since polymeric treatment will provide a silica gel with improved hydrophobicity and other improved properties as taught by Grainger.

Regarding claim 32, Jin fails to teach a polymeric methylsilane compounds.

Kotelnikov teaches polymeric methylsilane compounds for surface modification (see the abstract of the article).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Jin's process by applying a polymeric surface modifying agent of polymeric methylsilane compounds in stead of the monomer since polymeric treatment will provide a silica gel with improved hydrophobicity and other improved properties as taught by Kotelnikov.

Regarding claims 33 and 34, Jin in view of Grainger and Kotelnikov fails to teach surface modification agents containing methyltriacetoxysilane or hydrolysis/condensation product of methyltriacetoxysilane or polyacetoxysilane.

Art Unit: 2829

However, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Jin's process by applying a polymeric surface modifying agents containing methyltriacetoxysilane or hydrolysis/condensation product of methyltriacetoxysilane or polyacetoxysilane compounds in stead of the monomer these compounds are a form of oxy- silane compounds and since polymeric treatment will provide a silica gel with improved hydrophobicity and other improved properties as taught by Grainger.

2. Claims 22 – 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin, EP 0849,796 in view of Grainger, US 5,686,549 and Kotelnikov, RU 2089499.

These claims are rejected by applying the same prior art and arguments as were provided above in rejecting claims 2 – 21 since they are not patentably distinct from claims 2 – 21 and is also taught by Jin in column 1, line 6.

3. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jin, EP 0849,796 in view of Grainger, US 5,686,549 and Kotelnikov, RU 208 as applied to claim 8 above, and further in view of Burns, US 5,750,610.

Jin in view of Grainger and Kotelnikov fails to teach adding additional monomer in the solution.

Burns teaches surface modifying agents of monomer as well as high molecular weight siloxanes which cleaves to low molecular weight in column 6, lines 30 – 35 and mixtures of two or more are taught by Burns in column 6, lines 36 – 39.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Jin's method by using a combination of a monomer and a

Art Unit: 2829

polymer as taught by of Grainger and Kotelnikov in view of Burns so that the hydrophobization process is improved.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claims 2 – 29 and 31 – 34 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 19 of U.S.

Patent No. 6,318,124 in view of Grainger, US 5,686,549 and Kotelnikov, RU 2089499.

US 6,318,124 teaches dielectric nanoporous silica film on a substrate by forming a coating with an oligomer or polymer of organo siloxanes, but fails to teach that the coating is capable of reacting with the silanol groups as a surface modification agent and render it hydrophobic.

Grainger and Kotelnikov teach that such organosiloxanes are capable of reacting with the silanol groups of a porous silica gel and hydrophobize the surface as described earlier in rejecting claims 2 – 29. The hydrophobization process occurs by the reaction of the organic agents with the silanol groups present in the silica gel.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to use Rutherford's process and at the same time automatically hydrophobize the silica surface since the silanol group on the silica film will react with the polysiloxanes to render hydrophobic character to the dielectric film as taught by Grainger and Kotelnikov.

(11) Response to Argument

The Examiner respectfully disagrees with the Appellant's arguments for the following reasons:

The Appellant argues in pages 6 and paragraphs 1 – 3 in page 7 that the secondary references of Grainger and Kotelnikov do not teach or suggest any art that can be combined with the primary reference of Jin to devise the present invention. The Appellant cites (see paragraph 3 of page 7) that Grainger fails to teach the formation of a nonporous silica film wherein the "pore surfaces of the film" are rendered hydrophobic. It is noted, however, that claims fail to mention the limitation "pore surfaces of the film are rendered hydrophobic". The Applicant acknowledges that Grainger imparts hydrophobicity to the film on a solid substrate surface (having anchoring groups such as hydroxyl groups, see column 3, lines 12 – 20 of Grainger). Additionally, the Applicant argues (in paragraph 4, page 7) that Kotelnikov is non-analogous art.

It is first pointed out that the primary reference of Jin teaches forming the nanoporous silica film especially a film with "micropores with diameters less than 10 nm" in column 4, line 30.

Art Unit: 2829

In response to Appellant's repetitive arguments that the secondary references are non-analogous art (paragraph 4 in page 7 and 8; and arguments in pages 11 and 12) as they do not pertain to nanoporous silica film, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

In the instant case, it is noted, however, that the Appellant's claims fail to mention that the invention is for rendering the "pore surfaces" of the film hydrophobic and instead pertains only to a nanoporous "silica" film on the substrate. Further, the Appellant even admits that Kotelnikov teaches rendering material based on silica hydrophobic (see paragraph 4, page 7). The primary reference of Jin teaches the application of surface modification agents for hydrophobization of silica film to produce nanoporous silica (silica xerogel is inherently nanoporous, also see column 4, line 30 for the pore size) by the monomeric form by the reaction of organoalkyl-silyl group with the silanol (hydroxy group attached to a silicon, which is inherent in Jin's silica xerogel) group on the silica film and fail to teach using the oligomeric or polymeric form.

The secondary reference of Kotelnikov (and Grainger) fills the deficiency of the primary references by showing that silica surface can be made hydrophobic by treating with oligomeric or polymeric form of the monomeric chemicals taught by the primary references and is therefore pertinent to the particular problem. The reactive groups of

the chemicals are the same in both references. The common thread is the modification of the surface of "silica".

It was never the Examiner's position that the secondary references taught reaction of the silanol groups with the oligomeric or polymeric surface modification agents. Rather, it is Examiner's position that the secondary references teach the use of polymers instead of the monomers as surface modifying agents for "silica".

In response to the Applicant's argument that Burns (paragraph 2, page 9 – paragraph 1, page 11) fails to teach hydrophobization of silica surface to produce a nanoporous film, it is pointed out that Burns was used to show that the higher molecular weight organosiloxanes are cleaved to low molecular weight siloxanes so that they are capable of reacting with the organosilicate modified silica gel. This is to show that the hydrophobized silica by an oligomer/polymer can also react with a monomeric siloxane compound in a way very much similar to that taught by Jin.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

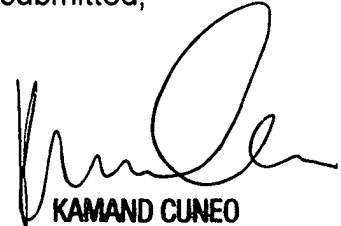
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